Deutsches Institut für
Wirtschaftsforschung

DIW BERLIN

www.diw.de

SOEP The German Socio-Economic Panel Study

SOEPpapers
on Multidisciplinary Panel Data Research

292

Thomas Cornelissen • John S. Heywood • Uwe Jirjahn

Profit Sharing and Reciprocity: Theory and Survey Evidence

Berlin, April 2010

SOEPpapers on Multidisciplinary Panel Data Research
at DIW Berlin

This series presents research findings based either directly on data from the German Socio-Economic Panel Study (SOEP) or using SOEP data as part of an internationally comparable data set (e.g. CNEF, ECHP, LIS, LWS, CHER/PACO). SOEP is a truly multidisciplinary household panel study covering a wide range of social and behavioral sciences: economics, sociology, psychology, survey methodology, econometrics and applied statistics, educational science, political science, public health, behavioral genetics, demography, geography, and sport science.

The decision to publish a submission in SOEPpapers is made by a board of editors chosen by the DIW Berlin to represent the wide range of disciplines covered by SOEP. There is no external referee process and papers are either accepted or rejected without revision. Papers appear in this series as works in progress and may also appear elsewhere. They often represent preliminary studies and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be requested from the author directly.

Any opinions expressed in this series are those of the author(s) and not those of DIW Berlin. Research disseminated by DIW Berlin may include views on public policy issues, but the institute itself takes no institutional policy positions.

The SOEPpapers are available at
http://www.diw.de/soeppapers

ISSN: 1864-6689 (online)

German Socio-Economic Panel Study (SOEP)
DIW Berlin
Mohrenstrasse 58
10117 Berlin, Germany

Contact: Uta Rahmann | urahmann@diw.de

Profit Sharing and Reciprocity: Theory and Survey Evidence

Thomas Cornelissen

Department of Economics, University College London

John S. Heywood

Department of Economics, University of Wisconsin-Milwaukee

Uwe Jirjahn

Department of Economics, University of Trier

Abstract: The 1/*n* problem potentially limits the effectiveness of profit sharing in motivating workers. While the economic literature suggests that reciprocity can mitigate this problem, it remains silent on the optimal degree of reciprocity. We present a representative model demonstrating that reciprocity may increase productive effort but may also increase unproductive effort such as socializing on the job. The model implies that reciprocity increases profit up to a point but decreases profit beyond that point. Using detailed survey measures of worker reciprocity, we show that the probability of receiving profit sharing takes an inverse U-shape as reciprocity increases. This supports the general implication of the model and is shown to exist for both positive and negative reciprocity and to remain when a series of ability proxies and detailed industry indicators are included.

Corresponding Author: Prof. J.S. Heywood, Department of Economics, University of Wisconsin-Milwaukee, P.O. Box 413, Milwaukee, WI 53201, USA.

Acknowledgements: The authors thank the Faculty of Economics at the University of Hanover for financial support that allowed the authors to work together.

1. Introduction

Profit sharing may suffer from the well-known free-rider problem. The incentive to contribute effort dissipates as the returns to that effort are distributed among all workers. Despite the clear implication of this 1/*n* problem, most empirical research shows that profit sharing has a positive influence on productivity.[1] Reciprocity among workers has been suggested as a central element in explaining the success of profit sharing. Workers under profit sharing enforce group effort norms by either punishing colleagues who shirk or by contributing effort toward others in the expectation of receiving similar treatment (helping on the job). In this paper, we argue that the centrality of reciprocity need not imply that maximum reciprocity is optimal. Extreme degrees of worker reciprocity generate off-setting costs ultimately predicting that profit sharing should be associated with intermediate levels of reciprocity.

We present an illustrative multi-task model in which reciprocity causes both greater productive effort and greater unproductive effort such as socializing at work. In this environment, the firm has an incentive to use profit sharing but hires workers with intermediate levels of reciprocity. This reciprocity encourages productive effort but the firm recognizes that greater reciprocity makes unproductive socializing (having fun with colleagues) increasingly valuable to workers reducing productive effort. The implication that firms using profit sharing should hire workers with an intermediate degree of reciprocity may help resolve previous empirical puzzles and suggests new statistical tests.

We examine the role of survey measures of worker reciprocity as determinants of whether or not workers receive profit sharing. Our estimates confirm that while greater reciprocity tends to increase the probability of receiving profit sharing initially, at high levels it decreases the probability. The identification of an interior degree of reciprocity provides broad support for our view. We confirm this for overall reciprocity and for both negative

reciprocity, punishing those who shirk, and positive reciprocity, contributing more when others do.

The next section presents a background discussion isolating the role of reciprocity, presents the theoretical model and suggests determinants of profit sharing beyond reciprocity. Section three presents the data and methodology while section 4 provides the empirical results. Section 5 concludes.

2. The Role of Reciprocity in Profit Sharing

2.1 Setting the Context

A large experimental literature identifies the importance of reciprocity as a behavioral motivation. The contexts are numerous including positive effort responses to high wages in contracts that cannot be enforced (Brown et al. 2004), the rewarding of trust (Berg et al. 1995; Altman et al. 2007) and the willingness to punish those who violate norms of cooperation (Fehr and Gachter 2000; Carpenter and Seki 2005). In these contexts and others, reciprocity tends to be confirmed even as the evidence for pure altruism and commitment is absent (Croson 2006). Indeed, the suggestion has been made that the individually oriented "homo economicus" should be replaced with" homo reciprocans," an agent who gains direct utility from responding in kind by punishing those who hurt and rewarding those who help (Bowles and Ginits 2003; Falk and Fischbacher, 2006; Cox et al. 2007, Cox et al. 2008). Survey evidence bolsters the experimental evidence with Dohmen et al. (2009) showing that positive reciprocity is associated with higher earnings, greater satisfaction and an enhanced ability to sustain personal relationships.

Our study is the first to use survey data to study the interaction of reciprocity between workers and profit sharing.[2] Under profit sharing, effort has an important public good aspect and reciprocity has been suggested as critical for effort provision. Workers with negative

reciprocity are thought to be more willing to punish those who shirk (Carpenter et al. 2009). This mutual monitoring and punishment helps enforce effort norms (Kandel and Lazear 1992) and its existence has been confirmed in case studies, experiments and survey data (Knez and Simester 2001; Freeman et al. 2008). Moreover, workers with positive reciprocity are thought to reward those who contribute or who help them directly. This increase in helping effort is thought particularly relevant in circumstances of team production in which each worker's output depends on the worker's own effort and help provided by colleagues (FitzRoy and Kraft 1986; Rotemberg 1994). Yet, empirical studies on profit sharing and helping on the job provide mixed results. Using survey data from Australia, Drago and Garvey (1998) find that individual performance pay reduces helping effort but fail to identify a role for profit sharing in increasing helping effort.[3] Burks et al. (2009) use a field experiment with bicycle messengers in Switzerland obtaining similar results. An experimental study by Wageman and Baker (1997) also finds no evidence that mutual help increases under profit sharing. In contrast, Encinosa et al. (2007) find that U.S. doctors receiving profit sharing are more likely to consult with one another about cases, a form of helping effort.

Despite numerous theoretical and empirical studies, the economic literature implicitly assumes that reciprocity is unambiguously productive. This would suggest that maximum reciprocity is optimal to reinforce the incentives for mutual monitoring and help provided by profit sharing. Yet, recognizing that reciprocity can help increase effort does not necessarily imply that firms with profit sharing should search only for workers with the greatest reciprocity. Reciprocity likely brings costs as well as the benefit of increased effort. There may be direct costs of implementing a high level of reciprocity such as search costs over workers and managerial costs. Moreover, and of particular interest to us because it seems most general, reciprocity is likely to apply to all social interaction at work not simply

productive effort. First, an extremely high level of negative reciprocity may involve excessive mutual monitoring and peer pressure resulting in reduced cooperation and unproductive conflicts.[4] Second, workers may both produce together and socialize together at work. Just as positive reciprocity can increase the willingness to exert mutual productive effort it can increase the willingness to socialize together at work. The first response brings value to the firm but the second does not. In such a multi-task framework, increased reciprocity can result in an increasing utility from socialization and willingness to substitute away from productive effort. At an extreme, a highly reciprocal workforce could thoroughly enjoy each other's company at work and not want productive effort to interfere with that enjoyment. Indeed, organization studies show a highly ambiguous link between group cohesiveness and group performance with an early review by Stogdill (1972) finding as many studies confirming a negative as confirming a positive association. More recently Dyaram and Kamalanbhan (2005) emphasize that cohesiveness will be detrimental to performance when coupled with interpersonal attraction, socializing, rather than task oriented norms. Such unproductive socializing should be taken seriously as it has routinely been identified as a major source of wasted work time accounting for as much as 1.7 hours per day for US full-time employees.[5]

In our illustrative model, we assume that reciprocal workers will respond in-kind to both productive and unproductive initiatives of their coworkers. The critical issue becomes the costs and benefits associated with each type of initiative and the aggregate constraints that allow workers to make trade-offs between the two types of initiatives. To illustrate we imagine that firms have no way to monitor or prohibit unproductive worker activities but do reward workers based on total output of the firm. The owners of the firm choose the profit maximizing degree of profit sharing and the profit maximizing degree of reciprocity between workers. We are explicit in assuming that reciprocity is a character trait of workers that firms may make choices over by selecting appropriate workers. While profit sharing provides

incentives to exert productive effort, it involves a free rider problem. Reciprocity can mitigate the free rider problem but very high degrees of reciprocity provide incentives to engage in unproductive socializing at work even though this reduces the firm's profit and, hence, workers' income. Therefore, the owners of the firm will combine profit sharing with an intermediate degree of reciprocity between workers.

Our model differs in three crucial ways from a recent theoretical contribution by Dur and Sol (2010) that also distinguishes between productive effort and unproductive social activities. First, Dur and Sol assume that each worker's cost of productive effort and cost of unproductive social activities are independent. We assume that unproductive socializing raises the marginal cost of productive effort. For example, unproductive socializing takes time making it more difficult to exert productive effort and reducing workers' incentive for such exertion. Second, Dur and Sol assume that workers respond (with altruistic feelings) only to their coworkers' unproductive socializing. In our model, workers reciprocate coworkers' unproductive socializing with own unproductive socializing and reciprocate coworkers' productive effort with own productive effort. As a consequence, and in contrast to Dur and Sol's contribution, coworkers' productive effort and not their unproductive socializing induces higher productive effort by each worker. Third, Dur and Sol take workers' utility functions as given. In our model, reciprocity as a character trait of workers is a choice variable of the firm when hiring. For example, the firm may use personality tests to select workers with the desired reciprocal traits.

2.2 An Illustrative Model of Reciprocity and Profit Sharing

We imagine a two activity model in which reciprocity plays a key role in determining the worker's utility generated from each activity. A worker's marginal utility from contributing to an activity increases as the level of other workers' contribution is higher. The first activity is

productive to the firm, productive effort. The second activity is not productive to the firm, socializing at work. The firm recognizes that reciprocity can mitigate the free-riding associated with profit sharing but also recognizes that the same reciprocity encourages socializing.

We imagine each of *n* workers receives an equal amount of the proportion of profits shared by the firm, *s*. For simplicity we assume that the firm's gross profit is simply the sum of the individual outputs of the workers (normalizing price to one and ignoring costs other than labor): $\pi = \sum_{i=1}^{n} q_i$. Assuming each worker's output equals his or her own effort, allows the worker's income to be written as

$$y_i = (s/n)\sum_{i=1}^{n} e_i \qquad (1)$$

Each worker chooses a level of productive effort e_i and socializing effort t_i to maximize utility given *s*, *n* and the degree of reciprocity that the workers share, γ .

$$U_i = y_i + \gamma(\prod_{i=1}^{n} e_i)^{1/n} + \gamma^2(\prod_{i=1}^{n} t_i)^{1/n} - (ce_i^2 + kt_i^2 + de_it_i) \qquad (2)$$

Utility is a positive function of earnings and the worker derives increasingly marginal utility from his own efforts (both productive and social) as the effort levels of coworkers rise. This is summarized in the geometric sums. The degree of reciprocity γ captures the influence of this interdependence on utility. For γ less than one, the interdependence among productive efforts plays a bigger role in influencing utility than does the interdependence among social efforts in influencing utility. This is reversed for γ greater than one. The worker's personal cost of effort is given by $ce_i^2 + kt_i^2 + de_it_i$ with *c*, *k*, *d* > 0. Here, *d* captures the degree of cost substitutability between the two types of effort. Increasing effort at one activity raises the marginal cost of effort at the other activity.

The representative worker maximizes (2) with respect to e_i and t_i generating two first-order conditions. Recognizing that all workers are identical allows substitution for all $e_{\sim i}$ and solving the resulting two equations and two unknowns solves the worker's problem:

$$e_i^* = \frac{2k(\gamma + s) - d\gamma^2}{n(4kc - d^2)} \qquad \forall i$$

$$t_i^* = \frac{2c\gamma^2 - d(s + \gamma)}{n(4kc - d^2)} \qquad \forall i \tag{3}$$

The worker's productive effort declines in *n* because of the free-rider problem. Productive effort increases in the profit sharing proportion, *s*, while unproductive effort decreases in *s*. The critical point is that the degree of reciprocity is not unambiguously associated with higher productive effort. At low levels of reciprocity productive effort increases as reciprocity increases but at high levels of reciprocity, productive effort decreases with further increases in the degree of reciprocity:

$$\partial e_i^* / \partial \gamma \gtreqless 0 \Leftrightarrow \gamma \lesseqgtr k/d \qquad \forall i \tag{4}$$

As the firm's net profit is $(1-s)\pi = (1-s)\sum_{i=1}^{n} e_i^*$, equation (3) also implies an inverse U-shaped relationship between the degree of reciprocity and net profit. Substituting (3) into net profit yields:[6]

$$(1-s)\pi = \frac{(1-s)(2k\gamma - d\gamma^2 + 2ks)}{4kc - d^2} \tag{5}$$

Maximizing with respect to both *s* and the degree of reciprocity yields the solution to the firm's problem:

$$\gamma^* = \frac{k}{d} \quad , \quad s^* = \frac{2d - k}{4d} \tag{6}$$

As long $d < 2(kc)^{1/2}$ (from 3) and $d > k/2$ (from 6), the firm has an incentive to adopt both

profit sharing and an interior solution to the degree of reciprocity. The incentives provided by profit sharing and reciprocity are mutually reinforcing. Profit sharing increases the return to productive effort and reduces the incentive to engage in unproductive socializing. However, profit sharing involves a free-rider problem. To increase the incentive for productive effort, profit sharing is combined with an intermediate degree of workers' reciprocity. The firm recognizes that too much reciprocity would lower productive effort as highly reciprocal workers would substitute toward socializing at work even though those unproductive activities would reduce workers' own profit sharing income.

A primary implication of the model is that firms using profit sharing should hire workers with an intermediate degree of reciprocity. In the individual survey data where stochastic influences play a role, this implication should be evident as an inverse U-shaped relationship between the degree of a worker's reciprocity and the probability of receiving profit sharing. If true, this might explain why those searching for linear relationships between helping effort and profit sharing (Drago and Garvey 1998) fail to confirm such relationships.

Workers with either very low or very high degrees of reciprocity would be sorted into individualistic jobs with few opportunities to interact with coworkers. In such jobs, team production may be minimal, likely making the degree of reciprocity irrelevant for productivity. As a consequence, profit sharing is unlikely and alternative individual incentive devices may be successful.

2.3 Further Determinants of Who Receives Profit Sharing

Following earlier research on the determinants of profit sharing, we control for a variety of factors so as to isolate the role of reciprocity. Importantly, we control for firm size because profit sharing may be less effective in larger firms as the $1/n$ problem becomes greater (Prendergast 1999, Oyer 2004). Yet, most studies find either no, or even a positive,

association between firm size and profit sharing (e.g., FitzRoy and Kraft 1987, 1995; Gregg and Machin 1988; Drago and Heywood 1995; Kruse 1996; Jones and Pliskin 1997; Heywood and Jirjahn 2002). This finding may result because of fixed costs in adopting profit sharing or because firms find ways to mitigate the free-rider problem.

We control for workers' tenure as repeated games have been suggested as a solution to the 1/*n* problem (MacLeod 1988; Che and Yoo 2001). However, we recognize that the assumptions of repeated games may be too stylized (FitzRoy and Kraft 1992). We will also control for the sector, occupation and even the detailed industry of the worker to capture the technology of production. Adams (2006) and Heywood and Jirjahn (2009) argue that production technologies characterized by high degrees of worker interdependence reduce the incentive for free-riding. In such technologies shirking by an individual worker decreases not only his own productivity but that of other workers implying a more drastic decline in total production and so in individual profit sharing income. Importantly, high degrees of interdependent worker productivity may only mitigate the free-rider problem without completely solving it (Adams 2006) leaving ample room for reciprocity to induce higher effort.

The complexity of tasks may also influence the provision profit sharing. If tasks are complex and multi-dimensional, a worker allocates effort across the productive activities. Individual performance measures are often unavailable for all tasks and rewarding workers for performance as measured by one or a few individual indicators causes workers to cut back on productive behaviors for which they are not rewarded (Holmstrom and Milgrom 1991).[7] In such a circumstance, profit sharing provides incentives to exert effort in all activities relevant to the firm's profit (Jirjahn 2000; Baker 2002). To capture multi-skilling we control for the worker's years of schooling.[8] Moreover, we control for hours of work. Complex tasks require extensive training and, hence, entail substantial quasi-fixed labor costs inducing

increased labor utilization through longer hours.[9]

Moreover, we control for measures of cognitive and non-cognitive skills that have been of increasing interest. We control for risk tolerance as profit sharing may change both earnings and employment risk. We also control for measures of body height, exercise and belief in self determination (as opposed to fate). These types of measures are interesting as researchers have confirmed that those on performance pay schemes have greater risk tolerance, greater self-esteem, less fatalistic attitudes and both greater cognitive and non-cognitive measured ability (Curme and Stefanec 2007; Grund and Sliwka 2010). We will examine the extent to which our available measures identify which workers receive profit sharing and also if the inclusion of these measures alters the role of reciprocity.

Finally, we will control for age, gender and marital status and hours. In addition, we will include variables for residency in the former East Germany and for foreign worker status.

3. Data and Methodology

Our data are drawn from the German Socio-Economic Panel (GSOEP), a large representative household survey (Wagner et al. 2007). The 2005 wave of that survey includes both the critical measure of profit sharing and a unique set of questions designed to identify each worker's extent of reciprocity. The information on reciprocity follows from a series of six statements to which workers are put the question "To what degree do the following statements apply to you personally?". Respondents choose a one to seven point Likert scale ranging from "does not apply to me at all" to "applies perfectly to me". As an example of positive reciprocity, the statements include "If someone does me a favor, I am prepared to return it." As an example of negative reciprocity, they include "If somebody puts me in a difficult position, I will do the same to him/her." All six statements are reproduced in Table

1, which also shows the distributions of the responses.

We construct scores of overall reciprocity, positive reciprocity and negative reciprocity by adding up the underlying variables, coded from 0 to 6, associated with each type of reciprocity. Consequently, our score for overall reciprocity can range from 0 to 36, and the scores for positive and negative reciprocity can range from 0 to 18. The overall reciprocity scale combining the six items has a Cronbach's alpha of 0.63 suggesting a reasonable amount of co-variation. The separate positive and negative scales hold together better with Cronbach's alphas of 0.64 and 0.85. Using the individual questions as dependent variations rather than the scores, confirms the same basic patterns and reveals little variation of interest.

We define individuals as working under profit sharing if they claim that they received profit sharing or bonuses as a response to the following structured question: "Did you receive any of the following additional payments from your employer last year?" While we note the potential ambiguity in the question, we emphasize that there exists a separate SOEP question identifying performance pay, earnings that depend on performance appraisals (see Cornelissen et al. 2008).[10] The data set also includes a rich set of control variables described in Section 2.3. Definitions and descriptive statistics of all variables used in the analysis are given in Table A1 and Table A2.

We estimate the determinants of individual workers reporting that they receive profit sharing using probit models of the form:

$$\Pr(y_i = 1) = \Phi(a_1 r_i + a_2 r_i^2 + \mathbf{x}_i'\mathbf{b}), \qquad (7)$$

where r_i denotes reciprocity of worker i, a_1 and a_2 are the coefficients on the linear and quadratic term of reciprocity, $\mathbf{x}_i$ denotes a vector of control variables with associated coefficient vector $\mathbf{b}$, and $\Phi(.)$ is the standard normal cumulative density function. We will both include and exclude the squared term as part of our early presentation. We also

recognize that the use of the squared term in the non-linear probit equation requires careful attention when discussing magnitudes. Moreover, we will implement a test specifically designed to uncover the presence of an inverse U-shaped relationship, a test that goes beyond simply uncovering the presence of a quadratic term influence.

As the information on reciprocity is only available in the 2005 wave of the SOEP, we must use one cross-sectional data only and cannot implement fixed effects methods. However, our examination of the role of the measures of cognitive and non-cognitive skills stands as a robustness check as these are often considered proxies for unobserved ability. These include risk tolerance, body height, the belief in self-determination and the frequency of exercising sports.

4. Empirical Analysis

4.1 Regression Results

Table 2 shows probit regressions of profit sharing on reciprocity and control variables.[11] The first two columns present joint estimates for men and women. In specification (2.1) we include a linear term of the reciprocity score and present results that appear to suggest that reciprocity does not play a role as a determinant of sorting or being sorted into profit sharing schemes. Adding the quadratic term of the reciprocity score in (2.2) generates a clear inverse U-shaped relationship between reciprocity and the probability of working under profit sharing. Both the linear and the squared term of reciprocity are statistically significant at the 10 percent level and the likelihood ratio test rejects the hypothesis that the two reciprocity terms fail to add explanatory power to the estimate. This is the first support for our suggestion that some reciprocity can be important for successful profit sharing but that too much reciprocity can be harmful. It comes in a specification with our full set of basic individual controls and controls for sector, occupation and firm size. While not monolithic,

the basic tenor of the controls is that greater human capital and labor force attachment tend be positively associated with receiving profit sharing. The variables for hours of work, age, tenure and being married all take significant positive coefficients. Furthermore, firm size is positively linked with the probability of receiving profit sharing.

Next, we split the estimations by gender. Specification (2.3) shows that there is virtually no effect of reciprocity on profit sharing for females. While we can only speculate about this result, we emphasize that other work using the SOEP suggests that women under profit sharing are often less able to respond to the pressure from co-workers that is generated by profit sharing (Heywood et al. 2005). Thus, it may be that the intention to be reciprocal as elicited in the survey and the actual ability to reciprocate differ more for women than for men. In any event, we use this result to focus the remainder of our analysis on male workers. As shown in specification (2.4), the inverse U-shaped relationship is far stronger among male worker than it was in the combined sample. Each term is now statistically significant at the 5 percent level.

Specification (2.5) divides the overall reciprocity into positive and negative reciprocity. The inverse U-shaped relationship appears for both types of reciprocity but shows up stronger for positive reciprocity than for negative reciprocity. This will change after we include further controls for the non-cognitive factors as the results for negative reciprocity will more nearly match the pattern shown for positive reciprocity.

In Table 3, we include the measures of risk tolerance and non-cognitive ability. In specification (3.1) we show that those with greater risk tolerance (less risk aversion) are more likely to be working under a profit sharing scheme. We emphasize that this would be expected if workers sort on the greater earnings risk associated with profit sharing but would not be true if workers sort on the reduced risk of unemployment and separation typically associated with profit sharing (Azfar and Danninger 2001). To the extent that greater risk

tolerance proxies unmeasured ability, it suggests positive sorting into profit sharing, a suggestion matched by our other skill measures.

Specification (3.2) indicates that the role of risk tolerance remains as body height is added. Moreover, the role of body height is large and significant. Taller workers are more likely to be paid according profit sharing schemes. This is interesting as US, UK and Germany studies suggest that throughout much of the range taller male workers earn more than their shorter counterparts (Case and Paxton 2008; Heineck 2005). Moreover, Case and Paxton (2008) show that the height premium can be explained with very detailed measures of cognitive ability. This suggests that height proxies unmeasured ability and, coming back to our results, that part of the return to that ability appears to happen through positive sorting into profit sharing schemes. These schemes are associated with higher earnings in general and in Germany in particular (Huebler 1993).

Specification (3.3) adds the indicator of belief in self-determination and shows that it is also a positive determinant of profit sharing. Specification (3.4) adds the indicator of never exercising (a negative proxy of being physically active) and shows it takes a negative and significant coefficient. Thus, in total all four of our measures take the anticipated coefficient if they were thought to proxy unmeasured ability and suggest there is positive ability sorting into profit sharing. When all four are included simultaneously, three remain highly statistically significant and one can easily reject the hypothesis that the four add nothing to the explanatory power using the log-likelihood test. Critically the inclusion of the new variables leaves intact the role of reciprocity. The inverse U-shaped relations remain for both positive and negative reciprocity and all four of the associated coefficients are highly significant. Thus, our attempt to use proxies of unmeasured ability to control for other causes of sorting leaves evident the strong relationship between reciprocity and profit sharing. Again, it is not a linear relationship as even in these specifications a linear reciprocity term

alone is small and statistically insignificant.

It might be thought that reciprocity is strongly related to the ability to get along with colleagues and that the fundamental relationship is between this ability and profit sharing. While profit sharing may influence the ability to get along with colleagues (Heywood et al. 2005), reciprocity clearly measures a different concept. In an auxiliary regression (available upon request) we used a Likert scale indicator of getting along with colleagues as a dependent variable in ordered probit estimations to be explained by the basic individual level variables and the reciprocity variables. While both were statistically significant, they took opposite signs. Although positive reciprocity was associated with better relations with colleagues, negative reciprocity was associated with worse relations with colleagues. Nonetheless, the two reciprocity measures influence the probability of receiving profit sharing in similar fashions. Thus, mutual monitoring and horizontal enforcement that can hurt relations with co-workers seems to exist at the same time as the helping effort that can help relations with co-workers.

Finally, we replace the broad industry (sectoral) indicators with sixty detailed industry dummies. This degree of control may be considered unusual but it helps account for technological differences that may influence the extent of team production and so the effectiveness of profit sharing. While many of the individual industry indicators take significant coefficients, their presence does not alter the role of the proxies we have just been discussing. More critically, their presence does not alter the familiar role of reciprocity. The inverse U-shaped relationships remain with the curvature apparently somewhat stronger for positive reciprocity, a point we turn to now in more detail.

4.2 Understanding Magnitudes and Examining the Inverse U-Shape

Interpreting the magnitudes associated with our estimates requires care because of the

combination of the non-linear probit estimation and the inclusion of both reciprocity and its square. One straightforward approach predicts the probability of receiving profit sharing for each individual level of the underlying reciprocity indices. Figure 1 makes just such a projection based on the estimate in Table 3, column 5, assuming all variables other than the reciprocity index being examined are held at their mean values. The first projection shows the predicted probability of profit sharing for each of the ordered 18 values of the positive reciprocity index and the second shows the predicted probability of profit sharing for the 18 values of the negative reciprocity index.

The inverse U-shape is clearly evident in both projections. The projection associated with positive reciprocity starts at essentially zero and increases to a high of around 15 percent before declining. The projection associated with negative reciprocity is more symmetrical. It starts around 8 percent and also increases to around 15 percent before declining. The estimated peak probability associated with positive reciprocity is 13.1 index points. This is larger than the estimated peak probability associated with negative reciprocity which happens at 9.9 index points.

An alternative for assessing the magnitude is to calculate the marginal effect. The marginal or partial effect of reciprocity indicator r_i is

$$\partial \Pr(y_i = 1) / \partial r_i = (a_1 + 2a_2 r_i) \cdot \phi(a_1 r_i + a_2 r_i^2 + \mathbf{x}_i'\mathbf{b}) \qquad (8)$$

where $\phi(.)$ is the standard normal probability density function. Using the same specification from Table 3, we calculate (8) one standard deviation in reciprocity above and below the peak probabilities. Again, all other variables are kept at their mean values. This reveals marginal effects of .012 for the positive reciprocity index and .006 for the negative reciprocity index. Thus, a one unit increase in the positive reciprocity index increases the probability of being paid profit sharing by more than 1.2 percentage points when evaluated one standard deviation (2.6 index points) before the peak and decreases the probability by the

same amount one standard deviation beyond the peak. The influence of a one point change in the negative reciprocity index is half this size. Thus, both these marginal effects and the pattern of the projections themselves suggest the magnitude of the reciprocity influences are economically as well as statistically meaningful.

While the pattern of the inverse U-shape appears evident from the projections, that appearance does not constitute a formal test. Recently Lind and Mehlum (2009) have formalized a test for the presence of an inverse U-shape relationship. They stress that the combination of a significant positive coefficient on a linear term and a significant negative coefficient on a squared term does not demonstrate an inverse U-shaped relationship. Confirmation requires that the implied peak be within the range of observed values and be sufficiently to the center of the range that the implied curvature results in a statistically significant positive slope left of the peak and a statistically significant negative slope right of the peak. As it is clear that the implied peaks for both of our measures of reciprocity are within their ranges, we implement the test developed by Lind and Mehlum (2009). It follows from testing the composite null hypothesis that the slope left of the peak is non-positive and/or the slope right of the peak is non-negative against the alternative of a positive slope to the left and a negative slope to the right. The program provided by the authors uses the extremes of the range as the default for testing the slopes (zero and 18 for our indices).[12] The estimates based on our data solidly reject the composite null hypothesis. Again, using the estimations in Table 3, Column 5, the null is rejected with a p-value of .002 for positive reciprocity and with a p-value of .046 for negative reciprocity. Thus, the formal test as well as the appearance from the projections strongly indicates the presence of the inverse U shape. In turn, this provides evidence of the importance of an intermediate level of reciprocity on the probability of receiving profit sharing.

5. Conclusion

We began with the suggestion that some reciprocity could be beneficial to profit sharing but that too much reciprocity could be harmful. At high levels of positive reciprocity workers may substitute socializing at work for productive effort. Similarly, at high levels of negative reciprocity workers may substitute "getting even" for productive mutual monitoring. Our representative model shows how an interior amount of reciprocity can be optimal for a firm that adopts profit sharing. This serves as the starting point of our empirical investigation.

The investigation estimates the determinants of individual workers receiving profit sharing using detailed survey measures of reciprocity as the critical independent variables. A simple linear term for reciprocity is never statistically significant. Yet, a simple quadratic specification, a linear term and a squared term, emerges as statistically significant for males. The inverse U-shaped relationship for males holds for both positive and negative reciprocity suggesting that intermediate degrees of each type of reciprocity are associated with the highest probability of receiving profit sharing.

The inverse U-shaped relationship remains after the inclusion of four variables that were thought to proxy otherwise unmeasured ability. These variables all took expected signs with three of the four simultaneously statistically significantly different than zero. They suggest that ability generates positive sorting into profit sharing schemes. The inverse U-shaped relationship also remains when adding detailed industry measured designed to control for different technologies in which profit sharing may be more or less successful. Indeed, the robust and durable relationship we uncover helps support the notion that moderate degrees of reciprocity may be more valuable to firms than extreme reciprocity. This insight should be carried forward into future empirical and theoretical work on profit sharing as previous researchers have been assuming simple unidirectional relationships.

Future work could improve on the empirical results presented if they had access to

appropriate panel data. While we are not aware of such data, we emphasize that simply holding worker fixed effects constant may be of limited value. While the underlying trait of reciprocity may well be correlated with unmeasured fixed effects that influence the decision to enter profit sharing, the variation in worker specific per period reciprocity is likely to be very small. The most useful application of panel data may be in matched employer-employee data in which one can observe an employer adopting or dropping profit sharing and watching the resulting pattern of sorting by reciprocity.

Table 1: Components of positive and negative reciprocity

	Positive Reciprocity				Negative Reciprocity		
	P1	*P2*	*P3*		*N1*	*N2*	*N3*
0 (does not apply to me at all)	0.19	0.48	1.73		16.31	19.75	15.66
1	0.19	0.79	2.88		20.05	23.85	21.4
2	0.54	2.15	5.69		18.79	19.98	18.66
3	2.48	7.53	15.33		20.4	17.67	20.15
4	7.03	17.4	23.95		12.29	10.1	12.16
5	26.28	34.56	26.83		6.11	4.65	6.61
6 (applies to me perfectly)	63.29	37.09	23.59		6.05	4.00	5.36
	100.00	100.00	100.00		100.00	100.00	100.00

Relative frequencies (in %) are based on the survey question "To what degree do the following statements apply to you personally?" answered on a seven-level Likert scale as shown in table.
P1: If someone does me a favor, I am prepared to return it.
P2: I go out of my way to help somebody who has been kind to me before.
P3: I am ready to undergo personal costs to help somebody who helped me before.
N1: If I suffer a serious wrong, I will take revenge as soon as possible, no matter what the cost.
N2: If somebody puts me in a difficult position, I will do the same to him/her.
N3: If somebody offends me, I will offend him/her back.

Table 2: Probit regressions of profit sharing

	(2.1) All	(2.2) All	(2.3) Female	(2.4) Male	(2.5) Male
Reciprocity	0.002 (0.005)	0.050* (0.028)	-0.012 (0.046)	0.077** (0.034)	
Reciprocity squared		-0.001* (0.001)	0.000 (0.001)	-0.002** (0.001)	
Positive reciprocity					0.269*** (0.101)
Positive reciprocity squared					-0.010*** (0.004)
Negative reciprocity					0.043* (0.023)
Negative reciprocity squared					-0.002* (0.001)
Firm size 20 - 199	0.229*** (0.079)	0.224*** (0.079)	0.310** (0.132)	0.190* (0.099)	0.186* (0.099)
Firm size 200 - 1999	0.466*** (0.082)	0.462*** (0.082)	0.520*** (0.143)	0.464*** (0.103)	0.457*** (0.104)
Firm size >= 2000	0.842*** (0.078)	0.835*** (0.078)	0.692*** (0.131)	0.913*** (0.100)	0.911*** (0.100)
Male	0.098 (0.061)	0.099 (0.061)			
Foreign	-0.276*** (0.104)	-0.278*** (0.104)	0.018 (0.186)	-0.392*** (0.124)	-0.373*** (0.125)
East German	-0.139** (0.068)	-0.140** (0.068)	-0.146 (0.118)	-0.114 (0.084)	-0.120 (0.085)
Age	0.042** (0.018)	0.043** (0.018)	0.077** (0.035)	0.034 (0.022)	0.036 (0.022)
Age Squared	-0.001*** (0.000)	-0.001*** (0.000)	-0.001** (0.000)	-0.000* (0.000)	-0.000* (0.000)
Married or living with partner	0.157** (0.074)	0.155** (0.074)	0.219* (0.122)	0.112 (0.094)	0.107 (0.094)
Actual work hours	0.015*** (0.003)	0.015*** (0.003)	0.011*** (0.004)	0.018*** (0.004)	0.019*** (0.004)
Years of job tenure	0.011*** (0.003)	0.011*** (0.003)	0.009* (0.006)	0.011*** (0.004)	0.012*** (0.004)
Years of schooling	0.034*** (0.012)	0.033*** (0.012)	0.050** (0.020)	0.023 (0.014)	0.021 (0.014)
Constant	-4.002*** (0.467)	-4.504*** (0.553)	-4.414*** (1.013)	-4.597*** (0.678)	-5.695*** (0.888)
Occupation dummies (6 groups) Sector dummies (9 sectors) Industry dummies (60 industries)	Yes Yes No	Yes Yes No	Yes Yes No	Yes Yes No	Yes Yes No
N	5206	5206	2028	3175	3175

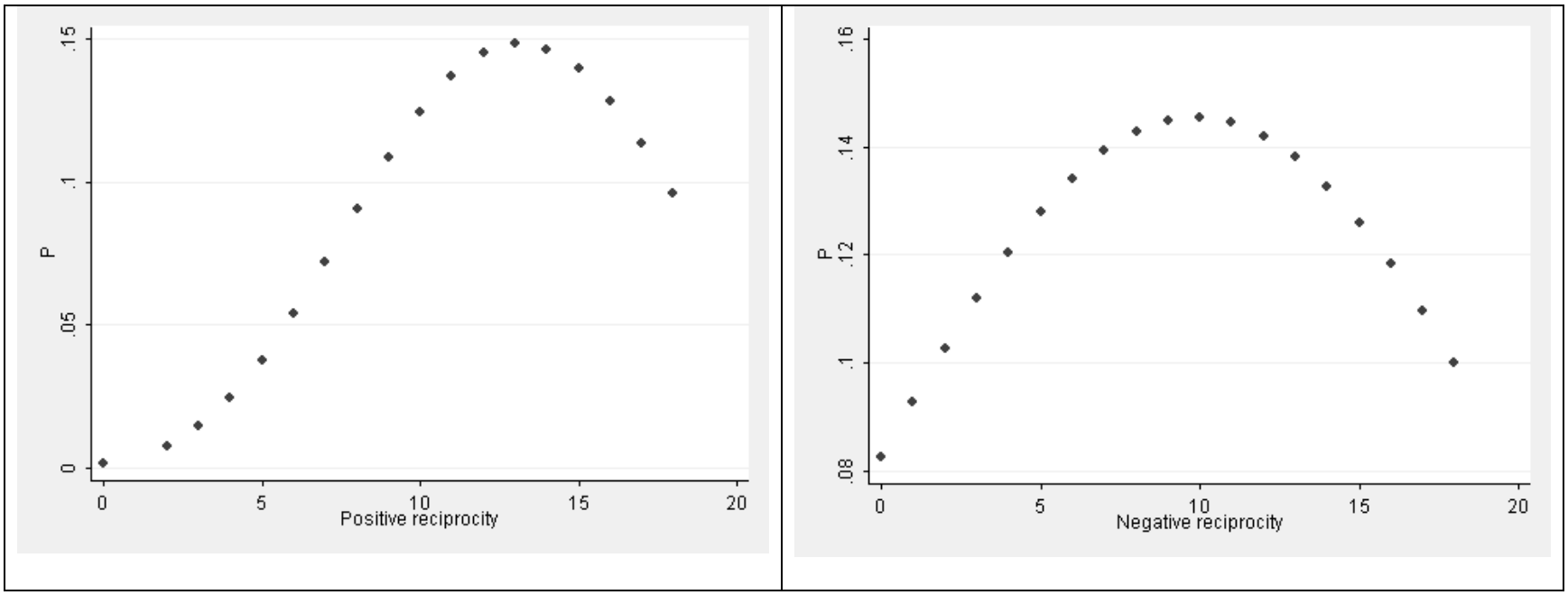
The table shows the estimated coefficients. T-statistics are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Probit regressions of profit sharing, sample of male employees

	(3.1)	(3.2)	(3.3)	(3.4)	(3.5)
Positive reciprocity	0.271***	0.266***	0.260***	0.251**	0.292***
	(0.102)	(0.101)	(0.098)	(0.099)	(0.100)
Positive reciprocity squared	-0.010***	-0.010***	-0.010***	-0.010***	-0.011***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Negative reciprocity	0.043*	0.043*	0.060**	0.061**	0.067***
	(0.023)	(0.023)	(0.024)	(0.024)	(0.025)
Negative reciprocity squared	-0.002*	-0.002*	-0.003**	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Firm size 20 - 199	0.186*	0.184*	0.174*	0.160	0.193*
	(0.100)	(0.100)	(0.100)	(0.101)	(0.105)
Firm size 200 - 1999	0.467***	0.466***	0.468***	0.456***	0.490***
	(0.104)	(0.104)	(0.105)	(0.105)	(0.110)
Firm size >= 2000	0.909***	0.903***	0.909***	0.901***	0.899***
	(0.100)	(0.101)	(0.101)	(0.102)	(0.107)
Foreign	-0.378***	-0.333***	-0.285**	-0.283**	-0.275**
	(0.125)	(0.126)	(0.127)	(0.128)	(0.130)
East German	-0.122	-0.109	-0.128	-0.121	-0.105
	(0.085)	(0.086)	(0.086)	(0.087)	(0.089)
Age	0.036	0.038*	0.038*	0.037	0.040*
	(0.022)	(0.022)	(0.023)	(0.023)	(0.023)
Age Squared	-0.000*	-0.000*	-0.000*	-0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Married or living with partner	0.108	0.100	0.086	0.082	0.068
	(0.094)	(0.094)	(0.095)	(0.095)	(0.096)
Actual work hours	0.019***	0.019***	0.018***	0.019***	0.020***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Years of job tenure	0.012***	0.012***	0.012***	0.011***	0.012***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Years of schooling	0.020	0.018	0.019	0.014	0.013
	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
Risk tolerance	0.027*	0.025*	0.019	0.017	0.014
	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
Body height		0.013***	0.013***	0.013***	0.014***
		(0.005)	(0.005)	(0.005)	(0.005)
Self determination			0.047***	0.047***	0.050***
			(0.011)	(0.011)	(0.011)
Never exercising				-0.229***	-0.209***
				(0.069)	(0.071)
Constant	-5.824***	-8.182***	-8.803***	-8.539***	-8.053***
	(0.902)	(1.237)	(1.226)	(1.238)	(1.444)
Occupation dummies (6 groups)	Yes	Yes	Yes	Yes	Yes
Sector dummies (9 sectors)	Yes	Yes	Yes	Yes	No
Industry dummies (60 industries)	No	No	No	No	Yes
N	3144	3138	3116	3102	3024

The table shows the estimated coefficients. T-statistics are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 1: Predicted probability of receiving profit sharing



The figures show the probability of profit sharing as a function of the positive and negative reciprocity scores with all other regressor held fixed at mean values. The projections are based on model 3.5 from table 3.

Table A1: Variable definitions

Profit sharing	Dummy = 1 if the employee receives profit-sharing and/or bonuses from his/her employer. Dummy = 0 otherwise.
Reciprocity	Score of adding up all reciprocity variables shown in table 1.
Positive reciprocity	Score of adding up the variables P1-P3 shown in table 1.
Negative reciprocity	Score of adding up the variables N1-N3 shown in table 1.
Married or living with partner	Dummy = 1 if the employee is married or lives with a partner in the same household. Dummy = 0 otherwise.
Years of job tenure	Years with current employer.
Firm size <20	Dummy = 1 if the worker employed in firm with less than 20 employees. Dummy = 0 otherwise.
Firm size 20-199	Dummy = 1 if the worker employed in firm with 20 to 199 employees. Dummy = 0 otherwise.
Firm size 200-1999	Dummy = 1 if the worker employed in firm with 200 to 1999 employees. Dummy = 0 otherwise.
Firm size >=2000	Dummy = 1 if the worker employed in firm with more than 1999 employees. Dummy = 0 otherwise.
Age	Age in years.
Actual work hours	Usual weekly work hours including overtime.
Years of schooling	Years of schooling constructed from categorical information on school and college degrees. Variable provided by SOEP survey team. We imputed missing values of this variable with mean years schooling.
Years of schooling missing	Dummy = 1 if years of schooling information is missing, Dummy = 0 otherwise.
Risk tolerance	Score of risk tolerance. Answers from the survey question "How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?" are coded on an 11-point Likert scale.
Body height	Reported body height in cm.
Self determination	Score of self-determination constructed from adding up three survey items measured on a seven-point Likert scale ranging from "disagree completely" to "agree completely". The items are "How my life goes depends on me", "What a person achieves in life is above all a question of fate or luck", "I have little control over the things that happen in my life". The last two items are recoded in inverse order before adding up.
Never exercising	Dummy = 1 if the employee never exercises during his/her free time. Dummy = 0 if the employee exercises sometimes or regularly.
Low skilled blue collar	Dummy = 1 for blue collar workers without formal qualification. Dummy = 0 otherwise.
Medium skilled blue collar	Dummy = 1 for blue collar workers with formal qualification and foremen. Dummy = 0 otherwise.
High skilled blue collar	Dummy = 1 for master craftsmen. Dummy = 0 otherwise.
Low skilled white collar	Dummy = 1 for white collar workers without formal qualification. Dummy = 0 otherwise.
Medium skilled white collar	Dummy = 1 for white collar workers with formal qualification and with simple and qualified duties. Dummy = 0 otherwise.
High skilled white collar	Dummy = 1 for white collar workers with highly qualified and / or managerial duties. Dummy = 0 otherwise.
Manufacturing	Worker employed in manufacturing.
Resource processing	Worker employed in resource processing.
Transport and Telecommunication	Worker employed in transport and telecommunication
Construction	Worker employed in construction.
Retail	Worker employed in retail.
Services	Worker employed in services.
Banking and insurance	Worker employed in banking and insurance.

Table A2: Descriptive statistics by gender and profit sharing regime

	Female private sector employees, N=2031						Male private sector employees, N=3175				
		Profit Sharing						Profit Sharing			
	All	No	Yes	Diff	p-value		All	No	Yes	Diff	p-value
Profit sharing	0.10						0.18				
Reciprocity	20.94	20.96	20.75	-0.21	0.59		21.77	21.84	21.48	-0.35	0.15
Positive reciprocity	14.70	14.74	14.38	-0.36	0.06		14.74	14.75	14.67	-0.08	0.53
Negative reciprocity	6.23	6.22	6.37	0.16	0.62		7.04	7.09	6.81	-0.28	0.17
Married or living with partner	0.84	0.84	0.88	0.04	0.11		0.85	0.84	0.90	0.06	0.00
Years of job tenure	9.09	8.90	10.76	1.85	0.00		11.43	10.91	13.77	2.86	0.00
Firm size <20	0.34	0.36	0.12	-0.25	0.00		0.22	0.25	0.07	-0.17	0.00
Firm size 20-199	0.28	0.28	0.21	-0.08	0.02		0.31	0.34	0.19	-0.15	0.00
Firm size 200-1999	0.17	0.17	0.23	0.06	0.03		0.23	0.23	0.24	0.01	0.57
Firm size >=2000	0.21	0.19	0.45	0.26	0.00		0.24	0.19	0.50	0.31	0.00
Age	41.28	41.41	40.09	-1.33	0.08		42.15	41.81	43.70	1.89	0.00
Actual work hours	32.46	31.86	37.81	5.95	0.00		43.85	43.30	46.32	3.02	0.00
Years of schooling	12.07	11.92	13.40	1.49	0.00		12.33	12.03	13.67	1.64	0.00
Years of schooling missing	0.02	0.02	0.02	0.00	0.78		0.02	0.02	0.01	-0.01	0.03
Risk tolerance	4.21	4.19	4.41	0.22	0.18		5.13	5.06	5.44	0.37	0.00
Body height	166.35	166.24	167.31	1.08	0.02		178.87	178.49	180.53	2.04	0.00
Self determination	15.20	15.08	16.27	1.19	0.00		15.60	15.43	16.37	0.93	0.00
Never exercising	0.35	0.37	0.19	-0.18	0.00		0.34	0.37	0.20	-0.17	0.00
Low skilled blue collar	0.19	0.21	0.06	-0.15	0.00		0.15	0.18	0.04	-0.14	0.00
Medium skilled blue collar	0.06	0.07	0.03	-0.04	0.03		0.33	0.36	0.19	-0.17	0.00
High skilled blue collar	0.00	0.00	0.00	0.00	0.56		0.02	0.03	0.01	-0.02	0.02
Low skilled white collar	0.09	0.10	0.02	-0.08	0.00		0.03	0.03	0.02	-0.01	0.51
Medium skilled white collar	0.56	0.55	0.62	0.07	0.07		0.19	0.19	0.18	-0.01	0.42
High skilled white collar	0.10	0.08	0.27	0.20	0.00		0.28	0.21	0.56	0.35	0.00
Manufacturing	0.21	0.21	0.21	0.00	0.87		0.40	0.39	0.42	0.03	0.21
Resource processing	0.06	0.05	0.16	0.11	0.00		0.09	0.08	0.12	0.04	0.00
Transport and Telecommunication	0.06	0.05	0.07	0.01	0.40		0.07	0.08	0.06	-0.01	0.27
Construction	0.03	0.03	0.01	-0.01	0.24		0.10	0.12	0.02	-0.10	0.00
Retail	0.29	0.31	0.16	-0.15	0.00		0.12	0.12	0.09	-0.04	0.01
Services	0.27	0.28	0.17	-0.11	0.00		0.14	0.14	0.16	0.02	0.20
Banking and insurance	0.07	0.05	0.20	0.14	0.00		0.05	0.04	0.10	0.06	0.00

References

Adams, Christopher P. 2006. “Optimal Team Incentives with CES Production.” *Economics Letters* 92: 143 – 48.

Azfar, Omar and Stephan Danninger. 2001. "Profit Sharing, Employment Stability and Wage Growth," *Industrial and Labor Relations Review* 54: 619 – 30.

Baker, G. 2002. “Distortion and Risk in Optimal Incentive Contracts,” *Journal of Human Resources* 37: 728 – 51.

Barron, John M. and Kathy Paulson Gjerde. 1997. “Peer Pressure in an Agency Relationship,” *Journal of Labor Economics* 15: 234 – 54.

Berg, Joyce, John Dickhaut and Kevin MacCabe. 1995. “Trust, Reciprocity and Social History,” *Games and Economic Behavior* 10: 122 – 42.

Berg, Stephen, Jeffrey Carpenter and Lorenz Goette. 2009. “Performance Pay and Worker Cooperation: Evidence from an Artefactual Field Experiment,” *Journal of Economic Behavior and Organization* 70: 458 – 469.

Bowles, Samuel and Herbert Gintis. 2003. “Homo Reciprocans,” *Nature* 415: 125 – 28.

Brown, Martin, Armin Falk and Ernst Fehr. 2004. “Relational Contracts and the Nature of Market Interactions,” *Econometrica* 72: 747 – 80.

Brown, Michelle and John S. Heywood. 2009. “Helpless in Finance: The Cost of Helping Effort Among Bank Employees,” *Journal of Labor Research* 30: 176 – 95.

Carpenter, Christopher, Samuel Bowles, Herbert Gintis and Sung-Ha Hwang. 2009. “Strong Reciprocity and Team Production: Theory and Evidence,” *Journal of Economic Behavior and Organization* 71: 221 – 32.

Carpenter, Christopher and Erika Seki. 2005. “Do Social Preferences Increase Productivity? Field Experimental Evidence from Fisherman in Toyama Bay,” IZA Discussion Paper 1697.

Case, Anne and Christina Paxton. 2008. "Stature and Status: Height, Ability and Labor Market Outcomes," *Journal of Political Economy* 116: 499 – 532.

Che, Y.K. and S.W. Yoo. 2001. “Optimal Incentives for Teams,” *American Economic Review* 91: 525 – 41.

Cornelissen, Thomas, John S. Heywood and Uwe Jirjahn. 2008. "Performance Pay, Risk Attitudes and Job Satisfaction," SOEP Papers, No. 136, DIW, Berlin.

Cox, James C., Daniel Friedman and Steven Gjerstad. 2007. “A Tractable Model of Reciprocity and Fairness,” *Games and Economic Behavior* 59: 17 – 45.

Cox, James C., Daniel Friedman and Vjollca Sadiraj. 2008. “Revealed Altruism,” *Econometrica* 76: 31 – 69.

Croson, Rachael. 2006.”Theories of Commitment, Altruism and Reciprocity,” *Economic Inquiry* 45: 199 – 216.

Curme, Michael and Noah Stefanec. 2007. "Worker Quality and Labor Market Sorting," *Economics Letters* 96: 202 – 08.

Dohmen, Thomas, Armin Falk, David Huffman and Uwe Sunde. 2009. “Homo Reciprocans: Survey Evidence on Behavioral Outcomes,” *Economic Journal* 119: 592 – 612.

Drago, Robert and Gerald T. Garvey. 1998. Incentives for Helping on the Job: Theory and Evidence,” *Journal of Labor Economics* 16: 1 – 25.

Drago, Robert and John S. Heywood. 1995. “Choice of Payment Schemes: Australian Establishment Data,” *Industrial Relations* 34: 507 – 31.

Dur, Robert, Arjan Non and Hein Roelfsema. 2008. “Reciprocity and Incentive Pay in the Workplace,” Tinbergen Institute Discussion Paper, TI 2008-080/1.

Dur, Robert and Joeri Sol. 2010. “Social Interaction, Co-worker Altruism, and Incentives,” *Games and Economic Behavior*, Forthcoming.

Dyaram, L. and T.J. Kamalanabhan. 2005. “Uneathered: The Other Side of Group Cohesiveness,” *Journal of Social Sciences* 10: 185 – 90.

Encinosa, William E., Martin Gaynor and James B. Rebitzer. 2007. "The Sociology of Groups and the Economics of Incentives: Theory and Evidence on Compensation systems." *Journal*

of Economic Behavior & Organization 62: 187 – 214.

Falk, Armin and Urs Fischbacher. 2006 "A Theory of Reciprocity," *Games and Economic Behavior* 54: 1347 – 81.

Fehr, Ernst and Simon Gaechter. 2000. "Cooperation and Punishment in Public Goods Experiments," *American Economic Review* 90: 980 – 94.

FitzRoy, Felix and Kornelius Kraft. 1995. "On the Choice of Incentives in Firms," *Journal of Economic Behavior and Organization* 26: 145 – 60.

FitzRoy, Felix and Kornelius Kraft. 1992. "Forms of Profit Sharing and Firm Performance: Theoretical Foundations and Empirical Problems," *Kyklos* 45: 209 – 25.

FitzRoy, Felix and Kornelius Kraft. 1987. "Cooperation, Productivity and Profit Sharing," *Quarterly Journal of Economics* 102: 23 – 36.

FitzRoy, Felix and Kornelius Kraft. 1986. "Profitability and Profit Sharing," *Journal of Industrial Economics* 35: 113 – 30.

Freeman, Richard, Douglas Kruse and Joseph Blasi. 2008. "Worker Responses to Shirking Under Shared Capitalism," Working Paper No. 14227, National Bureau of Economic Research, Cambridge, MA.

Freeman, Richard and Martin Weitzman. 1987. "Bonuses and Employment in Japan," *Journal of the Japanese and International Economy* 1: 168 – 94.

Gregg, P.A. and S.J. Machin. 1988. "Unions and the Incidence of Performance Linked Pay Schemes in Britain," *International Journal of Industrial Organization* 6: 91 – 107.

Grund, Christian and Dirk Sliwka. 2010. "Evidence on Performance Pay and Risk Aversion," *Economics Letters* 106: 8 – 11.

Hart, Robert and Olaf Huebler. 1990. "Wage, Labour Mobility and Working Time Effects of Profit Sharing," *Empirica – Austrian Economic Papers* 17: 115 – 30.

Heineck, Guido. 2005. "Up in the Skies? The Relationship Between Body Height and Earnings in Germany," *Labour* 19: 469 – 89.

Heywood, John S. and Uwe Jirjahn. 2009. "Profit Sharing and Firm Size: The Role of Team Production," *Journal of Economic Behavior and Organization* 71: 246 – 58.

Heywood, John S. and Uwe Jirjahn. 2002. "Payment Schemes and Gender in Germany," *Industrial and Labor Relations Review* 56: 44 – 64.

Heywood, John S., Uwe Jirjahn and Georgi Tsertsvadze. 2005. "Getting Along with Colleagues – Does Profit Sharing Help or Hurt?" *Kyklos* 557 – 74.

Holmstrom, B. and P. Milgrom. 1991. "Multitask Principal Agent Analyses: Incentive Contracts, Asset Ownership and Job Design," *Journal of Law, Economics and Organization* 7: 24 – 52.

Huebler, Olaf. 1993. "Productivity, Earnings, and Profit Sharing — An Econometric Analysis of Alternative Models," *Empirical Economics* 18: 357 – 89.

Jirjahn, Uwe. 2000. "Incentives for Multitasking: Fixed Wages or Profit Sharing?" *Economic Analysis* 3: 137 – 48.

Jones, Derek and Jeff Pliskin. 1997. "Determinants of the Incidence of Group Incentives: Evidence from Canada," *Canadian Journal of Economics* 30: 1027 – 45.

Kandel, Eugene and Edward Lazear. 1992."Peer Pressure and Partnerships," *Journal of Political Economy* 100: 801 – 17.

Knez, Marc and Duncan Simester. 2001. "Firm-Wide Incentives and Mutual Monitoring at Continental Airlines," *Journal of Labor Economics* 19: 743 – 72.

Kruse, Douglas L. 1996. "Why Do Firms Adopt Profit Sharing and Employee Ownership Plans?" *British Journal of Industrial Relations* 34: 515 – 538.

Kruse, Douglas L. 1993. *Profit Sharing: Does it Make a Difference?* W.E. Upjohn Institute for Employment Research: Kalamazoo, MI.

Lind, Jo Thori and Halvor Mehlum. 2009. "With or Without U? The Appropriate Test for a U-Shaped Relationship," *Oxford Bulletin of Economics and Statistics*, Forthcoming.

MacLeod, Bentley. 1988. "Equity, Efficiency, and Incentives in Cooperative Teams," in D.C.

Jones and J. Svenjar, eds., *Advances in the Economic Analysis of Participatory and Labor-Managed Firms*, Vol. 3. Greenwich, CT: JAI Press: 5 – 23.

Oyer, Paul. 2004. "Why Do Firms Use Incentives that Have No Incentive Effects?" *Journal of Finance* 59: 1619 – 49.

Prendergast, C. 1999. "The Provision of Incentives in Firms," *Journal of Economic Literature* 37: 7 – 63.

Rafael, Rob and Peter Zemsky. 2002. "Capital, Corporate Culture and Incentive Intensity," *RAND Journal of Economics* 33: 243 – 57.

Rotemberg, Julio. 1994." Human Relations in the Workplace," *Journal of Political Economy* 102: 685 – 717.

Stogdill, Ralph M. 1972. "Group Productivity, Drive, and Cohesiveness," *Organizational Behavior and Human Performance* 8: 26 – 43.

Ugarkovic, Marija. 2007. *Profit Sharing and Company Performance*, DUV (Gabler Edition Wissenschaft): Wiesbaden.

Wagemann, Ruth and George Baker. 1997. "Incentives and Cooperation: the Joint Effects on Task and Reward Interdependence on Group Performance," *Journal of Organizational Behavior* 18: 139 – 158.

Wagner, Gert G., Joachim R. Frick and Juergen Schupp. 2007. "The German Socio-economic Panel Study (SOEP): Scope, Evolution and Enhancements," *Journal of Applied Social Science Studies* 127: 139 – 69.

Endnotes

[1] Kruse (1993) presents his own evidence and reviews earlier studies while Ugarkovic (2007) provides a more recent review.

[2] Rafael and Zemsky (2002) model the interplay between individual performance pay and reciprocity among workers showing that such pay should reduce reciprocal behavior. Dur et al. (2008) also model the link between reciprocity and individual based incentives but consider a setting in which worker efforts are reciprocal to management attention. They show that the optimal contract in this setting should rely on promotion incentives rather than on individual bonuses. While their empirical analysis confirms that more reciprocal workers are more likely to receive promotion incentives, it cannot confirm the prediction that those workers are less likely to receive individual performance pay. Most importantly, neither study considers profit sharing.

[3] See Brown and Heywood (2009) for additional evidence that individual performance pay reduces incentives to help on the job.

[4] Barron and Gjerde (1997) provide a theoretical analysis of excessive peer pressure. However, they do not model the role of reciprocity.

[5] This statistic is taken from the 2007 Time Wasting Survey conducted by the HRM firm salary.com. In each of the five years of the survey, socializing at work has been either the first or second largest source of wasted time.

[6] We have consciously chosen a production function such that scale is irrelevant to the optimal incentive and reciprocity choices of the firm. By design the addition of the n workers' efforts exactly cancels out the fact that each worker produces less as n increases. In theory, it would be straight forward to allow for n to influence profitability and so scale.

[7]These behaviors may include maintaining equipment, cultivating customer goodwill, striving for quality, and reducing chances for workplace injury.

[8] Azfar and Danninger (2001) confirm a close empirical link between profit sharing and the extent of training.

[9] Hart and Huebler (1990) confirm that longer working hours as a proxy for task complexity are positively associated with profit sharing.

[10] Moreover, the Japanese experience suggests that bonuses often can be interpreted as profit sharing (Freeman and Weitzman 1987).

[11] Missing values of the schooling variable have been replaced by the mean value of years of schooling and a dummy variable added indicating the observations with missing values of schooling.

[12] The code is provided by the authors: http://fmwww.bc.edu/repec/bocode/u/utest.ado